Infortrend®

EonStor A08 / A12 Series

2Gb/s Fibre-to-SATA RAID Subsystem
SCSI-to-SATA RAID Subsystem

Installation and Hardware Reference Manual

Revision 1.2 (11, 2003)
Printed in Taiwan

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Warnings and Certifications

FCC (applies in the U.S. and Canada)

Class A statement applies to the series model equipped with Fibre host interface.

Class B statement applies to the series model equipped with SCSI host interface.

FCC Class B Radio Frequency Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules (47 CFR, Part 2, Part 15 and CISPR PUB. 22 Class B). These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with this user's guide, may cause harmful

interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help

This device complies with Part 15 of FCC Rules. Operation is subjected to the following two conditions: 1) this device may not cause harmful interference, and 2) this device must accept any interference received, including interference that may cause undesired operation.

Warning:
A shielded-type power cord is required in order to meet FCC emission limits and also to prevent interference to the nearby radio and television reception.

Use only shielded cables to connect I/O devices to this equipment. You are cautioned that changes or modifications not expressly approved by the party responsible for compliance could void you authority to operate the equipment.

FCC Class A Radio Frequency Interference Statement

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device may accept any interference received, including interference that may cause undesired operation.

NOTE:
This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

The changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Warning:
Use only shielded cables to connect I/O devices to this equipment.
You are cautioned that changes or modifications not expressly approved by the party responsible for compliance could void you authority to operate the equipment.

CE

This device is in conformity with
the EMC

Table of Contents

Safety Precautions

Precautions and instructions

- Prior to powering on the subsystem, ensure that the correct power range is being used.
- The EonStor subsystem comes with 8 or 12 drive bays (slots). Leaving any of these slots empty will seriously affect the efficiency of the airflow within the enclosure, and will consequently lead to the system overheating, which can cause irreparable damage.
- If a module fails, leave it in place until you have a replacement unit and you are ready to replace it.
- **Airflow Consideration:** The subsystem requires an airflow clearance especially at the front and at the rear.
- To handle subsystem modules, use the retention screws, eject levers, and the metal frames/face plates. Avoid touching PCB boards or connector pins.
- To comply with safety, emission, or thermal requirements, none of the covers or replaceable modules should be removed. Make sure that during operation, all enclosure modules and covers are securely in place.
- Be sure that the rack cabinet into which the subsystem chassis is to be installed provides sufficient ventilation channels and airflow circulation around the subsystem.
- Provide a soft, clean surface to place your subsystem on before working on it. Servicing on a rough surface may damage the exterior of the chassis.
- If it is necessary to transport the subsystem, repackage all drives and replaceable modules separately.

ESD Precautions:

Observe all conventional anti-ESD methods while handling system modules. The use of grounded wrist-strap and an anti-static work pad are recommended. Avoid dust or debris in your work area.

About This Manual:

This manual

- Introduces the EonStor RAID Subsystem series.
- Describes all the active components in the system.
- Provides recommendations and details about the hardware installation process of the subsystem.
- Briefly describes how to monitor the subsystem.
- Describes how to maintain the subsystem.

This manual does not

- Describe components that are not user-serviceable.
- Describe the configuration options of firmware, using terminal emulation programs or the RAIDWatch GUI that came with your subsystem.
- Give a detailed description of the RAID processing units, the RAID controllers embedded within the subsystem.

Who should read this manual?

This manual assumes that its readers are experienced with computer hardware installation and are familiar with storage enclosures.

Related Documentation

- Generic Operation Manual
- RAIDWatch User's Manual

Conventions

Naming

From this point on and throughout the rest of this manual the EonStor series is referred to as simply the "subsystem" or the "system" and EonStor is frequently abbreviated as ES.

Warnings

Warnings appear where overlooked details may cause damage to the equipment or result in personal injury. Warnings should be taken seriously. Warnings are easy to recognize. The word "warning" is written as "**WARNING**", both capitalized and bold and is followed by text in italics. The italicized text is the warning message.

Cautions

Cautionary messages should also be heeded for the messages can help you reduce the chance of losing data or damaging the system. Cautions are easy to recognize. The word "caution" is written as "CAUTION", both capitalized and bold and is followed by text in italics. The italicized text is the cautionary message.

Notes

These are messages that are used to inform the reader of essential but non-critical information. These messages should be read carefully and any directions or instructions contained herein can help you avoid making mistakes. Notes are easy to recognize. The word "note" is written as "NOTE", it is both capitalized and bold and is followed by text in italics. The italicized text is the cautionary message.

Lists

Bulleted Lists: - Bulleted lists are statements of non-sequential facts. They can be read in any order. Each statement is preceded by a round black dot " ▪ ".

Numbered Lists: - Numbered lists are used to describe sequential steps a user should follow in order.

Software and Firmware Updates

Please contact your system vendor or visit Infortrend's FTP site (ftp.infortrend.com.tw) for the latest software or firmware updates. Note that the firmware version installed on your system should provide the complete functionality listed in the specification sheet/user's manual. We provide special revisions for various application purposes. Therefore, DO NOT upgrade your firmware unless you fully understand what a firmware revision will do.

Problems that occur during the updating process may cause unrecoverable errors and system down time. Always consult technical personnel before proceeding with any firmware upgrade.

Chapter 1

Introduction

The EonStor (ES) serial ATA (SATA) RAID subsystem series described in this manual comes in six different models that provide users with flexible configuration options. The differences between the six models are described below.

1.1 Model Variations

Three 8-bay models and three 12-bay models, that come with 2Gbps Fibre channel (FC-2G), 160MB/sec SCSI (SCSI-160) or 320MB SCSI (SCSI-320) host interfaces, make up the six available models in the 2U version of ES SATA RAID subsystem series. The six models are shown below:

Model Name	Host Channels	Controller Board
ES A08F-G1A2	2 x FC-2G	IFT-7260S-8F2D (Single Controller)
ES A08U-G1A3	2 x SCSI-160	IFT-7260S-8U3D (Single Controller)
ES A08U-G1410	2 x SCSI-320	IFT-7260S-8U4D (Single Controller)
ES A12F-G1A2	2 x FC-2G	IFT-7260S-12F2D (Single Controller)
ES A12U-G1A3	2 x SCSI-160	IFT-7260S-12U3D (Single Controller)
ES A12U-G1410	2 x SCSI-320	IFT-7260S-12U4D (Single Controller)

Table 1-1: Available ES SATA Models

NOTE:

On receiving and unpacking your subsystem, please check the package contents against the included unpacking checklist. If any modules appear to be missing, please contact your subsystem vendor immediately.

Major Components

	8 drive bays			12 drive bays		
ES Models	**A08F-G1A2**	**A08U-G1A3**	**A08U-G1410**	**A12F-G1A2**	**A12U-G1A3**	**A12U-G1410**
RAID Controller	1	1	1	1	1	1
PSU	2	2	2	2	2	2
Cooling Module	2	2	2	3	3	3
Enclosure Monitoring	I^2C	I^2C	I^2C	I^2C	I^2C	I^2C
LCD Panel	1	1	1	1	1	1
Battery	N/A	N/A	N/A	Optional	Optional	Optional

Table 1- 2: Available ES RAID Subsystem Models

1.2 Enclosure Chassis

The ES's subsystem enclosure can be divided into a front and rear section. All major components can be accessed from either the front or the rear section.

NOTE:

*Components accessed through the front panel are referred to as "**Front Panel Components**" and Components accessed through the rear panel are referred to as "**Rear Panel Components**."*

1.2.1 Front Section

The front section of the subsystem features a 4 x 2 or 4 x 3 layout for eight (8) or twelve (12) 3.5" drives and a foldable LCD panel.

1.2.2 Rear Section

The rear section of the ES subsystem is accessed through the rear panel and is reserved for the RAID controller module, power supply units (PSU), and cooling fan modules.

1.2.3 Internal Backplane

An integrated backplane board separates the front and rear sections of the ES subsystem. These PCB boards provide logic level signals and low voltage power paths. They contain no user-serviceable components.

1.3 ES Subsystem Components

All the active components on the ES subsystems can be accessed through either the front or rear panel. The modular design of the active components facilitates their easy installation and removal. Hot-swap mechanisms are incorporated to eliminate power surges and signal glitches that might occur while removing or installing these modules.

1.3.1 Front Panel Overview

The front panel of the RAID subsystem described in this manual is shown in **Figure 1-1** and **Figure 1-2.** A description of each front panel component is given below.

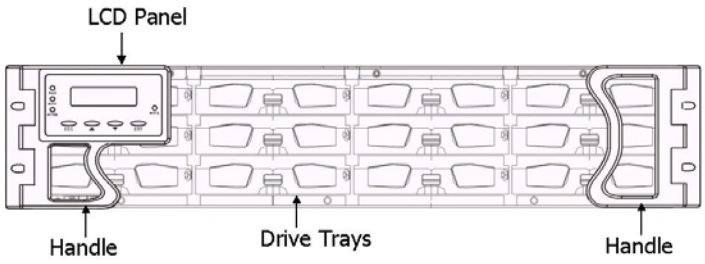

Figure 1-1: Front View – 12-bay Models

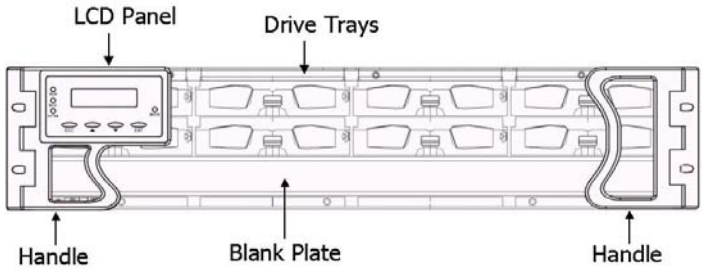

Figure 1-2: Front View – 8-bay Models

The front panels shown in Figure 1-1 and Figure 1-2 are designed to accommodate the following components:

- ***LCD Panel:*** The LCD Panel shows system information and can be used to configure and monitor the ES subsystem.

- ***Drive bays with drive tray canisters:*** The drive bays are used to house the ES subsystem hard drives.

1.3.2 Rear Panel Overview

The rear panels of the RAID subsystems described in this manual are shown in **Figure 1-3** (12-bay models) and **Figure 1-4** (8-bay models). A description of each rear panel component is given below.

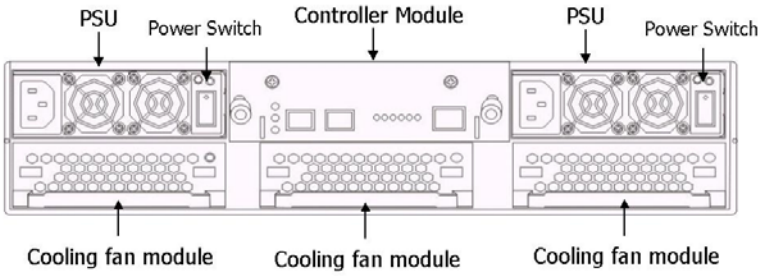

Figure 1-3: Rear View – 12-bay, Single Controller FC Port ES Subsystem

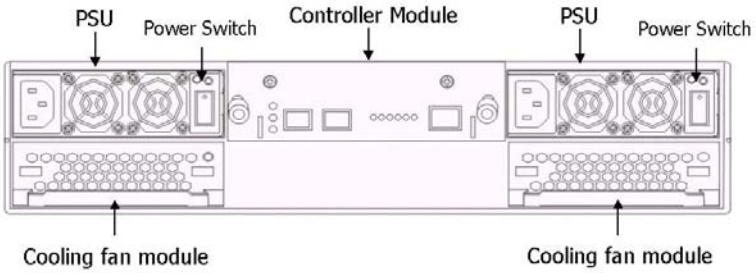

Figure 1-4: Rear View – 8-bay, Single Controller FC Port ES Subsystem

The rear panels shown above are designed to accommodate the following components:

- ***RAID controller module*:** The controller module contains a controller board, a DIMM module and, if installed the optional battery back up units (BBU).

- ***Power Supply Unit (PSU):*** The PSU is used to provide power to the subsystem.

- ***Cooling fan module:*** The redundant cooling FAN module is used to ventilate the subsystem and to reduce the temperature within the subsystem. The 12-bay model has an additional cooling module installed in the lower module bay.

NOTE:

Each of the power supplies on the sides of enclosure is housed with one cooling fan in a retrievable canister. When a power supply is removed, the cooling module is also removed. Therefore, replace the power supply unit as fast as possible when it becomes necessary. Cooling fan modules can be independently removed from the chassis without affecting PSU operation.

1.4 Front Panel Components

1.4.1 LCD Panel

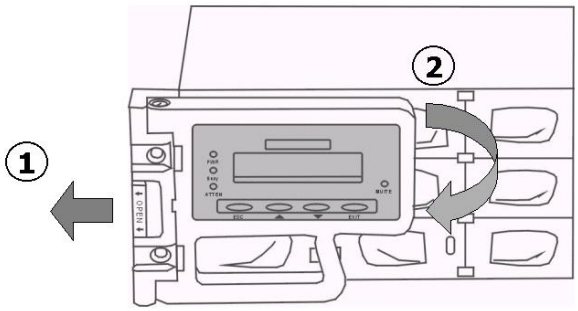

Figure 1-5: Opening Front Handle

The LCD panel shown in **Figure 1-5** consists of a 16 x 2 character LCD screen with push buttons and LED status indicators. The LCD front panel provides full access to all array configurations and monitoring. After powering up the subsystem, the initial screen will show the subsystem model name. A different name may be assigned for the system or different drive arrays. This will enable easier identification in a topology consisting of numerous arrays.

Figure 1-6: Front Panel Retention Latch

To access drive bays on the left or right column, first flip the retention latches on enclosure front handles, and then swing the handles to the left and right-hand sides. To close the handles, see **Figure 1-7,** first swing the handles towards the center to reveal the retention latch, flip the latch, and then proceed with closing the handles.

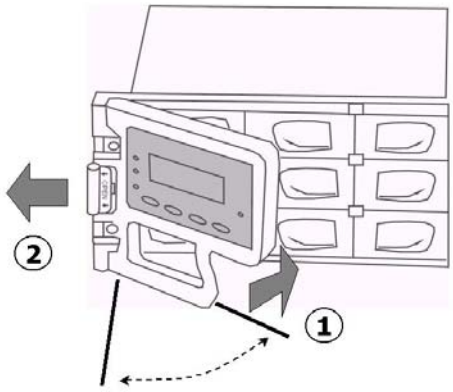

Figure 1-7: Closing the front handles

1.4.2 Drive Trays and Enclosure Bay ID Allocation

Eight (8) or twelve (12) drive bays for the installation of standard 1" height, 3.5" disk drives. The drive bays are accessed from the enclosure front and are easily accessible to the user.

As shown in **Figure 1-8** below, the ES subsystem is housed in an enclosure that is 4 bays wide by 3 bays or 2 bays high. Drive bays (slots) are, when viewed from the front, numbered 1 to 8 or 1 to 12, from the left to the right, and then from the top to the bottom.

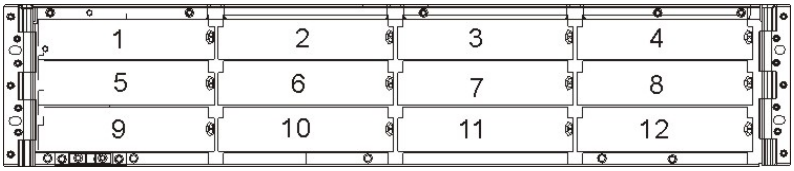

Figure 1-8: Hard Drive Numbering Sequence

1.4.3 Dongle Kits

The ES subsystems are designed to operate with SATA drives. If users wish to use parallel ATA (PATA) hard drives in their subsystem, then SATA-to-PATA dongle kits must be purchased separately and installed independently.

Prior to purchasing the subsystem, you should have determined whether to use SATA or PATA hard drives. If you wish to use PATA hard drives, the subsystem will be shipped with 8 or 12 SATA-to-PATA Dongle kits that must also be independently installed.

1.5 Rear Panel Components

1.5.1 The RAID Controller Module

The RAID controller module contains a main circuit board, necessary support interfaces, and a BBU that is optional only for the 12-bay models. The controller module contains no user-serviceable components. Except when replacing a faulty unit, installing a BBU, or installing/upgrading the cache memory inside, the controller module should never be removed or opened.

WARNING!

Although the RAID Controller can be removed, the only time a user should touch the controller itself is to replace the memory modules or to install the BBU. The RAID controller is built of sensitive components and unnecessary tempering can damage the controller.

1.5.2 Controller Module Interfaces

The ES subsystem controllers come with the following interfaces.

Host Interfaces

Subsystem Model	Host Channels
ES A08F-G1A2	2 x FC-2G
ES A08U-G1A3	2 x SCSI-160
ES A08U-G1410	2 x SCSI-320
ES A12F-G1A2	2 x FC-2G
ES A12U-G1A3	2 x SCSI-160
ES A12U-G1410	2 x SCSI-320

Table 1- 3: System Host Channels

SCSI-160 and SCSI-320 Host Ports: The SCSI host connects to the ES subsystem through two 0.8mm VHDCI SCSI connectors, which are located at the controller's face plate.

FC Host Ports: The FC host connects to the ES subsystem through two small form factor pluggable (SFP) sockets, which are located at the controller's faceplate.

FC Speed Detection: Speed auto-detection is specified by the Fibre Channel standard. If a 1Gbps port is connected to a 2Gbps port, it will negotiate down and run at 1Gbps. If there are two 2Gbps ports on either end of the link, the link will be run at 2Gbps.

Drive Interfaces

All the series models come with SATA drive channels that are connected through the back plane to the disk drives.

NOTE:

Unlike other RAID controller products, the subsystem comes with preset configurations for channel mode and channel IDs settings, and should be sufficient for most applications.

Ethernet Ports

All the controller modules on the subsystems come with a single RJ-45 Ethernet port. The Ethernet port is used for local or remote management through the network.

RS-232C (Audio Jacks)

The controller modules all come with one RS-232C (Audio Jack) serial port. The serial port is used for accessing the controller embedded configuration utility through a terminal interface.

1.5.3 Power Supply Units

Two 350W redundant hot swappable power supply units (PSUs) are located at the rear of the enclosure. If one PSU fails, the second PSU will be able to supply sufficient power to keep the system running. The power switches for these PSUs are located at the rear of each module. (See ***Figure 1-3***)

The specifications for the PSUs are shown in ***Table 1-4*** below.

Specification	Description				
Nominal power	350 Watts with active PFC				
Input voltage	100~240VAC ±10%				
Input frequency	47 ~ 63 Hz				
Input current	6A @90VAC; 3A @230VAC				
Power factor correction	Yes				
Hold-up time	At least 16ms at 115/230VAC full load after a loss of AC input				
Over temperature protection	Lost cooling or excessive ambient temperature				
Over current limit	+3.3V		21A ≤ Iout ≤ 40A		
	+5V		26A ≤ Iout ≤ 50A		
	+12V		25A ≤ Iout ≤ 48A		
Size	248.9(D) x 128.8(W) x 82.1(H) mm.				
Operating temperature	Min	Max	Non-Operating	Min	Max
	0	50		-40	70
Acoustic noise	115V input, full load of +5V; 0.5A of +12V				50 dB max.

Table 1-4: PSU Specifications

Power Supply LED Indicators

Power Supply Condition	Power Supply LED
No AC power	OFF
AC present / only standby outputs	OFF
Power supply DC outputs ON and ok	Green
Power supply failure (over-voltage & fan fail)	Red

1.5.4 Cooling Fan Modules

Two (2 for 8-bay models) or three (3 for 12-bay models) pre-installed cooling fan modules (see ***Figure 1-9***) come with the subsystem. One 12cm blower housed in each cooling module and can provide 39.5 CFM of airflow running at the speed of 3100rpm.

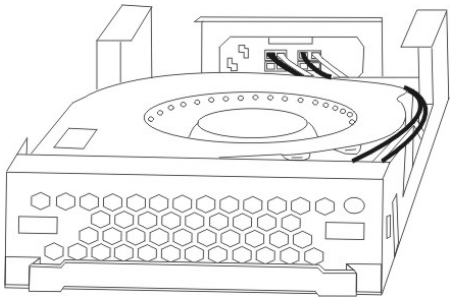

Figure 1-9: Top view of a cooling fan module

1.6 ES Subsystem Monitoring

The ES RAID subsystem comes with a number of different monitoring methods that enable users to constantly be updated on the status of the system and individual components. The following monitoring features are included in the subsystem.

1.6.1 I²C bus

The following subsystem elements are interfaced to the RAID controller over a non-user serviceable I^2C bus:

- PSU (presence and failure detect)
- Cooling FAN Module
- Temperature sensors (The temperature of the RAID controller board)

1.6.2 LED Indicators

The following active components all come with LEDs that indicate the status of the individual component.

- RAID Controller
- LCD Panel
- Cooling FAN Module
- PSU Module
- Drive Trays

1.6.3 Firmware (FW) and RAIDWatch GUI

Firmware: The firmware is a pre-installed software that is used to configure the subsystem. The firmware can be accessed either through the LCD

keypad panel or a terminal emulation program running on a management computer that is connected to the subsystem's serial port.

RAIDWatch: RAIDWatch is a premier web-based graphics user interface (GUI) that can be installed on a remote computer and accessed via the web. The manager communicates with the array via the connection of the existing host interface or Ethernet link to the array's LAN port.

1.6.4 Audible Alarms

The ES subsystem comes with audible alarms that will be triggered when certain active components fail or when certain (controller or subsystem) thresholds are exceeded. If you hear hastily repeated beep tones from the ES subsystem it is imperative that you immediately determine and rectify the problem.

The event notification messages indicate the completion or proceeding on with array configuration task and are always accompanied by two or three successive and prolonged beeps.

WARNING!

Failing to respond when a critical alarm is heard can lead to permanent damage of the ES subsystem. If an audible alarm is heard, rectify the problem as soon as possible.

Chapter 2

Hardware Installation

The modular design of the ES RAID subsystem simplifies the installation process. This chapter describes the installation procedures for the subsystem.

CAUTION!

Please note that the installation instructions described in this chapter should be carefully followed to prevent any difficulties and damages to your system.

2.1 Installation Pre-requisites

1. **Static Free Installation Environment** – The ES subsystem must be installed in a static free environment to minimize the possibility of electrostatic discharge (ESD) damage. (See ***Section 2.2***).

2. **Component Check –** Before the ES subsystem is installed, you should first, during the unpacking process, check to see that you have received all the required components. (See ***Section 2.3***) If any of them appears to be damaged, contact your vendor for a replacement.

3. ***Memory Modules*** – Your systems come with a DIMM module installed in the RAID controller unit. If you wish to replace the pre-installed memory module, you should remove the RAID controller unit before replace the original DIMM module. (See ***Section 2.5.1***)

4. ***Rack Installation*** – the array can be installed into a 19" industry standard rack cabinet.

   - The minimum for installing the array is 490mm in depth. The array can be installed into a standard 700 or 800mm depth rack cabinet.
   - Weight of the system: 24kg without drives
   - A minimum gap of 25mm clearance between the front of rack (rack cover) and 50mm between rear of array chassis and rear of the rack.

5. ***Dongle Kits***- If you wish to use PATA drives in the subsystem, a SATA-to-PATA dongle kit needs to be installed to each drive tray. (See ***Section 2.9.2***)

6. ***Hard drives –*** SATA or PATA hard drives must be purchased separately prior to the ES subsystem installation.

7. **Cabling** – All the FC or SCSI cables that are used to connect the ES subsystem to the host computers must be purchased separately. (See ***Section 4.2.1***) The SCSI models come with an external cable in the accessory kit.

8. **SFP Transceivers** – If the FC cables, that were previously purchased, do not come with preinstalled SFP transceivers, these must be separately purchased and connected to the SFP cables. (See ***Section 4.2.3***)

2.2 Static-Free Installation

Static electricity can damage the electronic components of the system. Most of the controllers that are returned for repair are the results of improper installation and ESD damage. To prevent ESD damage to any of the components, before touching or handling them follow these precautions:

- Discharge the static electricity from your body by wearing an anti-static wristband or by touching a grounded metal surface.
- Avoid carpets, plastic, vinyl or styrofoam in your work area.
- Handle any components by holding its edges or metal frame. Avoid touching PCB boards or connector pins.

2.3 Unpacking the Subsystem

Use the unpacking checklist in your package to check packing contents. Carefully check the items contained in each box before proceeding with installation.

NOTE:

A detailed packing list can also be found in the ***Appendix D*** of this manual.

Each packed box is separated into upper and lower levels.

Upper Level: The box on the upper level contains:

- Eight (8) or twelve (12) drive canisters
- Accessories items

Lower Level: The lower box should contain the enclosure chassis with all the pre-installed components. The pre-installed components should include:

- PSU modules
- RAID controller module
- LCD panel
- Cooling fan modules
- Enclosure PCBs

Accessory items are placed in a box on the top of the controller module. They include power cords, screws, Audio Jack cable, a quick installation guide, and a CD containing the Hardware Manual (this document), Generic Operation (Firmware) Manual, and the RAIDWatch GUI software.

2.4 General Installation Procedure

Following all the instructions provided below can save subsystem installation time. Detailed, illustrated instructions for each component are given in the following sections.

CAUTION!

To ensure that your system is correctly installed, please follow the steps outlined below. If you follow these steps then the installation will be fast and efficient. If you do not follow these steps then you may accidentally install the hardware incorrectly.

1. Change the cache memory DIMM modules – ***Section 2.5.2***.
2. Install the optional BBU – ***Section 2.6***
3. If the controller has been removed for installing/replacing the DIMM or BBU modules, please refer to ***Section 2.7*** for more details.
4. Rack-mounting the subsystem – ***Section 2.8*** (using the optional slide rails by Infortrend)
5. Install the dongle kits into the drive trays – ***Section 2.9.2***
6. Install the hard drives into the drive trays – ***Section 2.9***
7. Install the drive trays (with the hard drives) into the subsystem - ***Section 2.10***

2.5 Memory Module Installation

The ES subsystem comes with preinstalled PC-133 SDRAM DIMM's. If you prefer SDRAM modules with a different storage capacity, the pre-installed modules must be removed before installing the new modules.

If you do not wish to change the memory modules, skip this section and move on to the ***Section 2.6***. If you wish to install new memory modules, please refer to the installation procedure below.

2.5.1 Selecting the DIMMs

Please contact your supplier or Infortrend's technical support for an updated list of DIMM modules that are compatible with the controllers on the subsystem.

2.5.2 DIMM Module Installation Steps

WARNING!

Prior to change new memory modules, it is necessary to remove the preinstalled modules. Do this with care. Delicate components can be damaged during the process.

1. Loosen the controller module hand screws and remove the controller box.

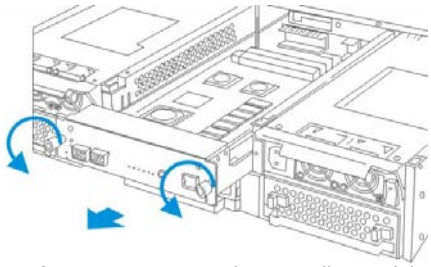

Figure 2-1: Remove the controller module

2. Remove the previously installed memory modules from the controller module.

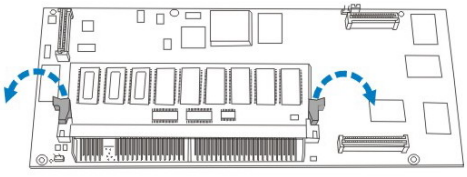

Figure 2-2: Remove the memory module

3. ***Install a memory module*** into the DIMM socket by positioning the module toward the socket with the notches in the module aligned with keys in the socket. Check that the module is completely seated and tabs on the sides of the socket hold the module firmly in place.

4. If you do not wish to install a BBU module***, install the controller module.*** Controller Module installation instructions can be found in ***section 2.7***. If you wish to ***install a BBU module***, refer to ***section 2.6*** for installation instructions.

2.6 BBU Installation

NOTE:

The BBU is an optional item on the 12-bay models, and is currently not available for the 8-bay models.

The BBU is used to maintain the data stored in the cache in the event of power loss. It is able to support the memory cache for up to 72 hours. If you are not installing a BBU module then please move on to ***section 2.7***. If you wish to install a BBU module please follow the instructions given in ***section 2.6.1***.

2.6.1 Installation Procedure

To install the BBU into the controller module, please follow these steps.

1. ***Make sure that a DIMM module has been installed***. The BBU module is installed directly above the DIMM module. If the BBU is installed before the DIMM module, it will have to be removed to install a DIMM module.

2. ***Remove the two retention screws*** that are on either side of the DIMM module, diagonally across from each other.

3. Two spacers should have come with each BBU unit. Install one spacer into each of the screw holes that previously contained the retention screws. (See ***Figure 2-3Figure 2-***)

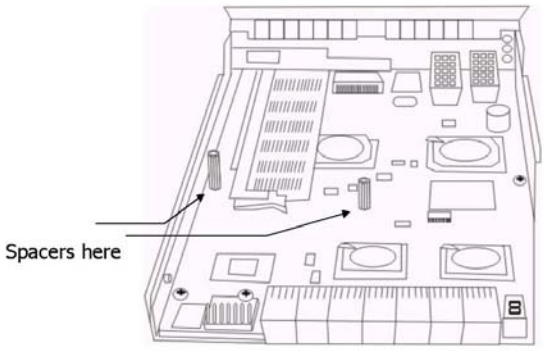

Figure 2-3: Install Spacers

4. Once the spacers have been inserted, ***connect the BBU connector*** to the onboard connector on the side of the controller board. Make sure that the connector is firmly attached and that the connection is secure. (See ***Figure 2-4***)

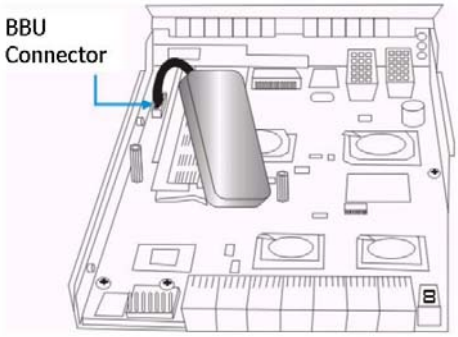

Figure 2-4: Connecting the BBU to the controller board

5. After the BBU connectors have been firmly connected to the controller board, ***mount the BBU bracket*** onto the two spacers. Correctly line the arms of the bracket with the two spacers such that it is possible to re-insert the previously removed retention screws. (See ***Figure 2-5***)

6. Once the BBU bracket has been correctly aligned with the spacers, ***re-insert the retention screws***, through the arms of the bracket, into the spacers. This will secure the BBU to the controller module. (See ***Figure 2-5***)

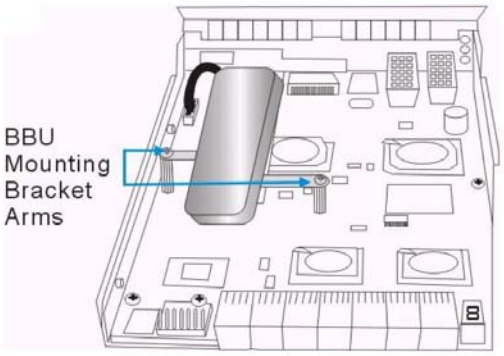

Figure 2-5: Mounting the BBU

7. Once the DIMM module and the BBU module have been installed, install/reinsert the controller module into the subsystem.

2.7 Installing the RAID Controller Module

If on any occasion a controller is removed and then is to be reinstalled, please follow these steps:

1. ***Hold the RAID controller unit by its edges*** and insert it into the controller bay. Push the unit in until it reaches the end of the controller

bay. The guide rails on the sides of the controller bay should make the plug-in process an effort-less task. You should be able to feel the contact resistance of the docking connector when pushing the controller inwards.

2. ***Make sure*** the controller module is completely seated in the controller slot and then secure the two hand screws on the sides of the module. (See ***Figure 2-6***) When properly installed, the module's faceplate should be aligned with the blanking plate on the lower controller bay.

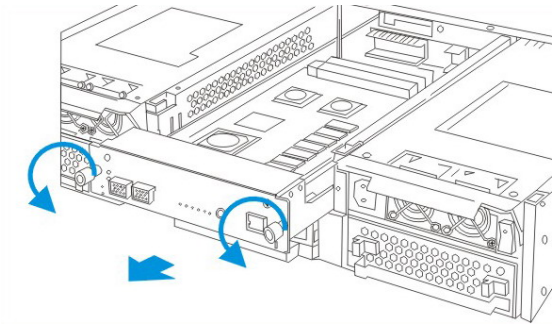

Figure 2-6: Inserting the Controller Module

2.8 Rackmounting

The subsystem is easily installed into a standard 19" rack cabinet using the mounting holes on the sides of chassis.

The enclosure chassis can be installed using self-purchased mounting rails, rear-attached brackets, or Infortrend's ***IFT-9272CSlider*** rails.

2.8.1 Considerations for Installation Site and Chassis

- Make sure you have an appropriate site location and cables prepared with adequate lengths to connect to mains power and other devices
- The rails support a cabinet depth of 700 or 800mm.
- Two people will be required to install the chassis and disk drives should only be installed when chassis is properly mounted. Using the slide rails, one person can install the array. The array can weigh about 24Kgs.
- Be careful when using power tools. Chassis finish and cabling can be accidentally damaged.
- The following tools are necessary for mounting the chassis:
  - #4 Phillips-head screw driver

- Wrenches may be necessary depending on the rack type

- Use the included M5 or M6 screws for securing the chassis through its front mounting ears.

- More details about the use of optional slide rails are given in the Installation Guide that came with the slide rail package.

2.8.2 Mounting Holes Positions

1. Integrators may design their own brackets or slide rails using the twenty-two (22) mounting holes on the sides of chassis. The chassis can be installed into a rack cabinet 700mm or 800mm in depth (length measured between the front and rear rack poles).

2. There are six (6) mounting holes with six (6) of M4 nuts near the end of chassis on each side. Shown below are the locations of these mounting holes (see the arrow marks). Also see the next diagram for another group of mounting holes on a horizontal line.

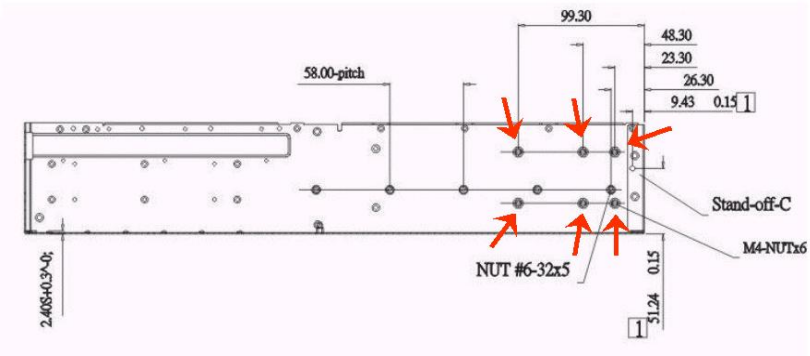

Figure 2-7: Enclosure Side Mounting Holes (1)

3. Shown in Figure 2-8: Enclosure Side Mounting Holes (2) are the holes designed to be used with slide rail options. There are five (5) mounting holes for #6-32 screws on the sides of enclosure for use with slide rails either purchased separately from Infortrend or other vendors.

4. You may purchase Infortrend's slide rail option (P/N: IFT-9272CSlider). For information on installing the chassis using the slide rails, please refer to the *Rackmounting Guide* that came with the kit.

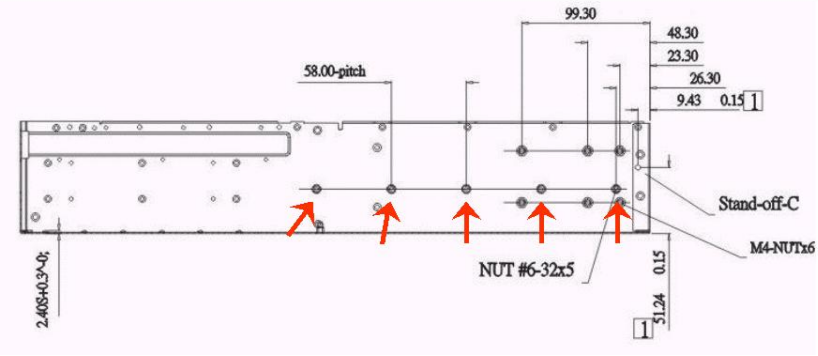

Figure 2-8: Enclosure Side Mounting Holes (2)

5. Use M5 or M6 pan-head screws to secure the chassis to the front cabinet posts.

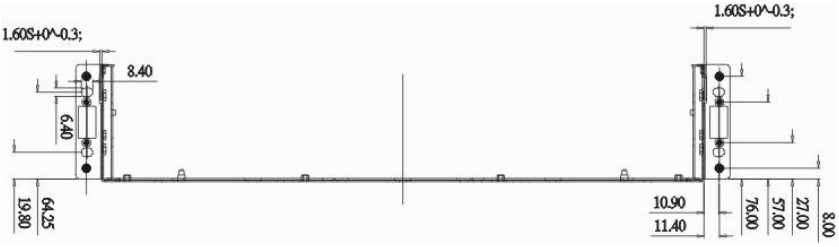

Figure 2-9: Front Ear Holes

2.9 Hard Drive Installation

WARNING!

1. *Handle hard drives with extreme care. Hard drives are very delicate. Dropping a drive onto a hard surface (even over a short distance), hitting or contact with the circuits on the drives by your tools, may all cause damage to drives*

2. *Observe all ESD prevention methods when handling drives.*

2.9.1 Hard Drive Installation Pre-requisites

CAUTION!

The hard drive and drive trays should only be installed into the subsystem once the subsystem has been mounted into a rack cabinet. If the hard drives are installed first then the subsystem will be too heavy to handle and the possible impact during the installation process might damage your drives.

Hard drives for the subsystem must be purchased separately. When purchasing the hard drives, the following factors should be considered:

- ***Capacity (MB / GB) –*** Use drives with the same capacity. RAID arrays use a "least-common-denominator" approach. The maximum capacity of each drive be used by the array is the maximum capacity of the smallest drive. Choose drives with the same storage capacity.

- ***Profile –*** The drive trays and bays of the system are designed for 3.5" wide x 1" high hard drives. It is highly recommended that users do not try to use drives of any other size.

- ***Drive Type –*** The subsystem described in this manual can use either SATA or PATA hard drives. Please ensure that you purchase the correct hard drives.

2.9.2 Dongle Kit Installation

Single controller subsystems: If you wish to use PATA drives in the subsystem, separately purchased SATA-to-PATA dongle kits are available and must be installed into each drive tray prior to the installation of PATA drives.

NOTE:

Drive trays with a pre-installed dongle board is also available (IFT-9272ADT1S1P)

1. ***Installation****:* The dongle kit (IFT-9270AN1S1P-0011) shown in ***Figure 2-10*** is mounted onto a metal base plate that has three pre-drilled holes reserved for retention screws.

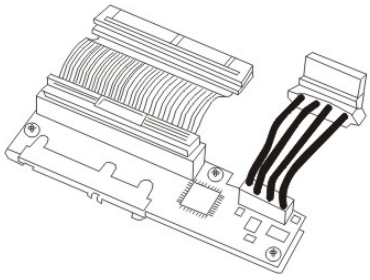

Figure 2-10: SATA-to-PATA Dongle kit

2. Three corresponding pre-drilled screw holes can be found at the back of the drive tray shown in ***Figure 2-11***.

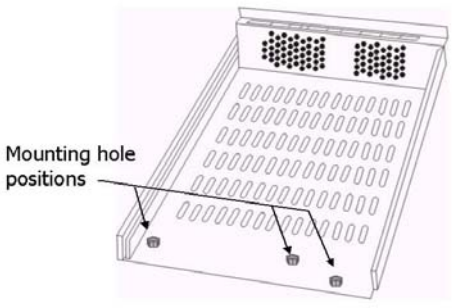

Figure 2-11: Empty Drive Tray

3. ***Place the dongle kit at the back of the drive tray***. Hold the dongle kit in place and turn the drive tray over. ***Align the holes*** in the base of the drive tray with the holes in the dongle kit base tray.

4. ***Insert the three available retention screws*** from the bottom of the drive tray. These screws will firmly secure the dongle kit to the drive tray and facilitate the installation of the appropriate drive.

2.9.3 Drive Installation without Dongle Kit

1. ***Place the SATA hard drive into the drive tray*** (as shown in ***Figure 2-12***) making sure that the hard drive is oriented in such a way that the drive's SATA connector is facing the back of the drive tray.

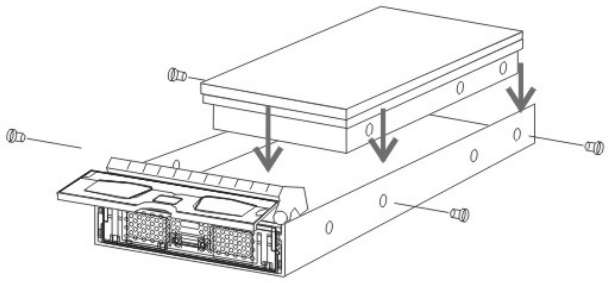

Figure 2-12: Installing a SATA Hard Drive

2. ***Adjust the drive's location*** until the mounting holes in the drive canister are aligned with those on the hard drive. Secure the drive with 4 supplied 6/32 flathead screws. (See ***Figure 2-12***)

WARNING!

Only use screws supplied with the drive canisters. Longer screws might damage the drive.

2.9.4 Drive Installation with Dongle Kit

1. ***For the PATA drives, connect the hard drive to the dongle kit*** and make sure that the dongle kit connector is firmly attached to the hard drive's connector (. ***For the PATA drives, connect the ATA and power cables*** from the dongle kit to the hard drive (see ***Figure 2-13***). Make sure that these connections are secure and will not come loose.

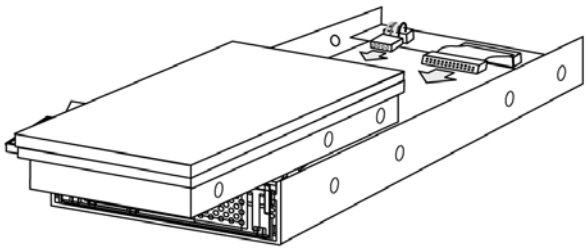

Figure 2-13: PATA Hard Drive Connectors

2. Once the connectors from the dongle board have been firmly attached to the hard drive, ***place the hard drive into the drive tray*** as shown in ***Figure 2-14***.

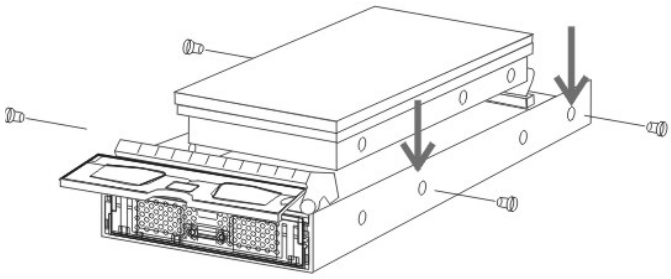

Figure 2-14: Inserting the PATA Drive

3. ***Adjust the drive's location*** until the mounting holes in the drive canister are aligned with those on the hard drive. Secure the drive with 4 supplied 6/32 flat-head screws.

2.10 Drive Tray Installation

Once the hard drives have been installed in the drive trays, the drive trays can be installed into the subsystem.

1. If a hard drive has been installed, make sure that it has been securely attached to the drive tray.

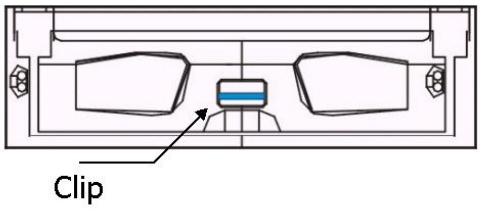

Figure 2-15: Front view of an individual drive tray.

2. ***Open the front flap on the drive tray*** (see ***Figure 2-16***). To open the flap, push the clip (shown in ***Figure 2-15***) on the front of the drive tray in an upward direction. The clip is easily accessible and is easily lifted.

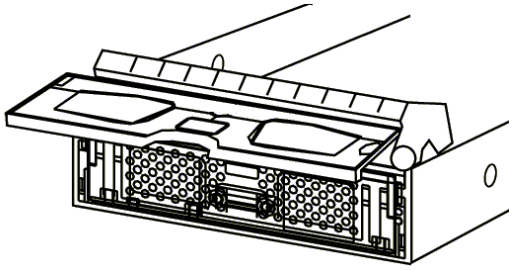

Figure 2-16: Drive Tray Front Flap

3. ***Line the drive tray up with the slot*** in which you wish to insert it. Make sure that it is resting on the rails inside the enclosure. Once the drive tray is lined up with the slot, gently slide it in. This should be done smoothly and gently.

4. ***Close the front flap on the drive tray***. Make sure the front flap is closed properly. Closing the front flap ensures that the SCA connector at the back of the drive tray is firmly connected to the corresponding connector on the backplane board. If the front flap is not closed properly then the connection between the HDD and the subsystem will not be secure.

WARNING!

All the drive trays (even if they do not contain a hard drive) must be installed into the enclosure. If they are not installed into the enclosure then the ventilation required for cooling will not be normalized and the subsystem will be overheated.

Chapter 3

System Monitoring

3.1 Overview

This chapter provides user information on how to monitor ES RAID subsystem. LEDs, Audible Alarm, terminal session and GUI software can all be used to monitor the status of the RAID subsystem.

3.2 System Monitoring

The system can be monitored in four different methods:

- ***Firmware:*** Using the front LCD keypad panel or the PC Hyper-Terminal session. (See ***Section 3.3***)
- ***LEDs:*** These LEDs indicate important system status include drive trays, LCD panel, controller modules, cooling FAN modules and PSUs to system administrators. (See ***Section 3.4***)
- ***Software***: The GUI software called RAIDWatch for easy monitoring and managing the subsystem. (See ***Section 3.5***)
- ***Notification Processing Center (NPC):*** The NPC is a powerful module that can, itself, be installed redundantly on different hosts. It is used for event notification over Email, LAN broadcast, and SNMP traps. (See Section ***3.6***)
- ***Audible Alarm***: An audible alarm will be triggered when certain system thresholds are violated. The alarm notifies, alerts or warns users about different events. (See ***Section 3.7***)

3.3 Firmware

The firmware resides in controller flash memory. The system can be configured and monitored through a firmware embedded utility. Both the front panel LCD screen and a PC terminal can access it. Use of the embedded Firmware utility has been fully described in the ***"Generic Operation Manual***" that came with your system. Please refer to this manual for further information.

3.4 System LEDs

3.4.1 Controller Module LEDs

Controller module LEDs are shown as below:

Figure 3-1: LED Definitions for A08F-G1A2

Figure 3-2: LED Definitions for A08U-G1A3 and A08U-G1410

Figure 3-3: LED Definitions for A12F-G1A2

Figure 3-4: LED Definitions for A12U-G1A3 and A12U-G1410

These figures show the LEDs on the controller's faceplate that can be accessed from the rear of the enclosure. Definitions for the different controller LEDs are given below.

NOTE:

*In the models using FC host channels, Fibre channel link status can be found on the left of the controller faceplate marked **A, B** and/or **C**. Other LEDs are common to all models and can be found towards the center of the faceplate and these are marked numerically from **1** to **6**.*

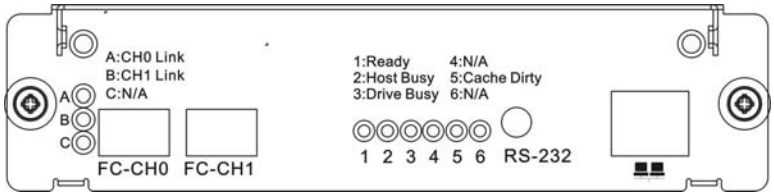

Figure 3-1: LED Definition for A08F-G1A2

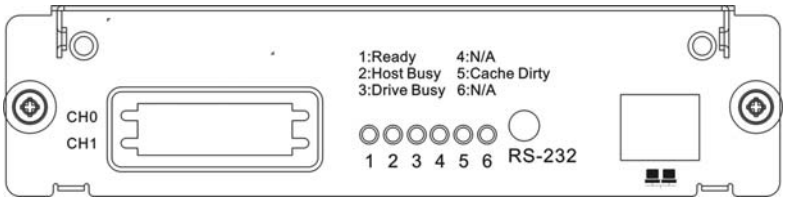

Figure 3-2: LED Definition for A08U-G1A3 and A08U-G1410

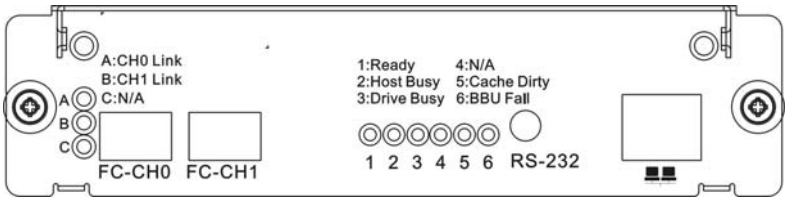

Figure 3-3: LED Definition for A12F-G1A2

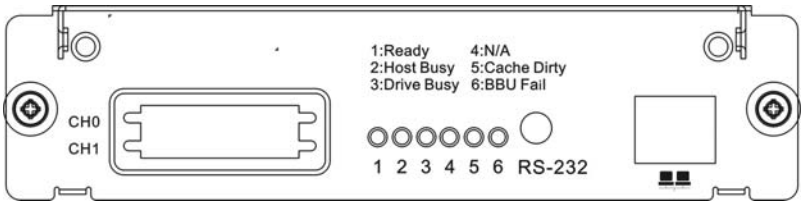

Figure 3-4: LED Definition for A12U-G1A3 and A12U-G1410

LED	Name	Color	Status
1	**CONTROLLER READY**	Green	**ON:** Indicates controller is active and operating properly. **FLASHING:** Controller Initialization is taking place. **OFF:** Controller is not ready for operation.
2	**HOST PORTS BUSY**	Green	**FLASHING:** Activities on the Host Ports. **OFF:** No activities on the Host Ports.
3	**SATA DRIVE BUSY**	Green	**FLASHING:** Activities on the SATA Drive Ports. **OFF:** No activities on the SATA Drive Ports.
4	**N/A**	-	***Note:*** *This LED is currently reserved.*
5	**CACHE DIRTY**	Amber	**ON:** Host writes are currently cached in memory. If the main power is lost, BBU will support this LED meaning cached data is held up by battery.
6	**BBU FAULT**	Amber	**ON:** The BBU is under charge or failed. Cannot hold charge to sustain cached data. **OFF:** The BBU functions normally and is sufficiently charged to sustain cached data. **FLASH SLOWLY:** The BBU is charging. ***Note:*** *This LED is only functional on the 12-bay models, and when the model is installed with a BBU module.*

Table 3-1: Controller module LED Definitions

LED	Name	Color	Status
A	**CH0 LINK**	Green	**ON:** Channel 0 link has been established. **OFF:** Channel 0 link has not been established or has been cut off.
B	**CH1 LINK**	Green	**ON:** Channel 1 link has been established. **OFF:** Channel 1 link has not been established or has been cut off.
C	**N/A**	-	***Note:*** *This LED is currently reserved.*

Table 3-2: Controller module LED Definitions (For Fibre channel models only)

LAN Port LEDs

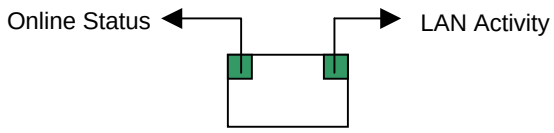

Figure 3-5: LAN Indicators

Name	Color	Status
Online Status	Green	**ON:** Indicates currently connected to LAN
LAN Activity	Green	**Blinking:** Indicates active transmission

Table 3-3: LAN Port LED Definitions

3.4.2 LCD Panel

The LCD panel located on the front aluminum foldable handle, comes with three statuses LEDs. The LEDs are marked from top to bottom "**PWR**", "**BUSY**" and "**ATTEN**" and are clearly seen in ***Figure 3-6*** below. The definitions of these LEDs are shown in ***Table 3-4***.

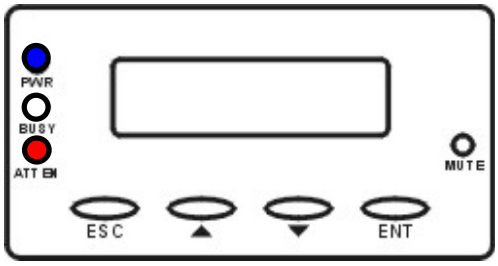

Figure 3-6: LCD Panel

Name	Color	Status
POWER	Blue	**ON:** Power On **OFF:** No Power
BUSY	White	**ON:** Host/Drive Channel Busy **OFF:** No Activity
ATTENTION	Red	**ON:** Illuminates when there are component failure/status events reported by the firmware. **OFF:** No status events reported by the firmware

Table 3-4: CD Panel LED Definitions

The mute button can be used to stop the alarm until the next controller event occurs.

3.4.3 Drive Tray – Single Controller Model

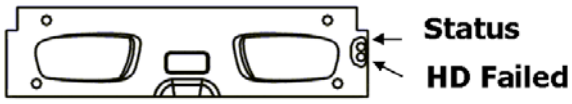

Figure 3-7: Drive Tray Indicators

- **Status** – A blue light indicates the drive is ready. A blinking blue light indicates when data is being written to or read by the drive in the tray.
- **HD Failed** - Red light indicates a hard drive failure.

Unlike SCSI or Fibre drives, slot numbers indicated the drive locations of this system. The first drive slot is slot 1. When notified by drive failure message, users should check drive tray indicators to find the location of the failed drive. Replacing the wrong drive can fatally fail a logical array.

3.4.4 PSU LEDs

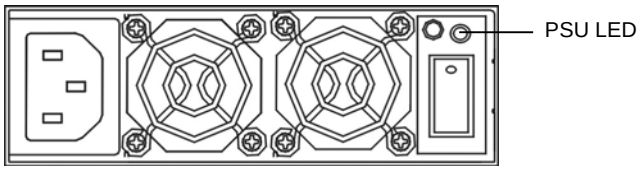

Figure 3-8: PSU LED

Each PSU comes with a single LED at the back (See ***Figure 3-8***). The LED is located just above the power switch on the right hand side. When the RED LED lit, it indicates that the PSU has failed. When the LED is **GREEN** indicates that the PSU is functioning properly.

3.4.5 Cooling Module LEDs

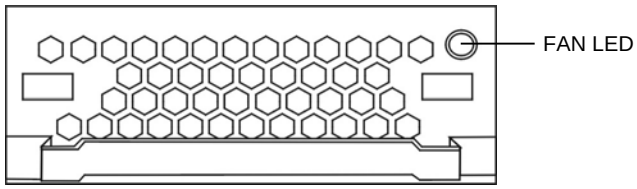

Figure 3-9: Cooling FAN Module LEDs and cooling FAN locations

Each cooling FAN modules has one red LED on the back. The LED corresponds to the single fan in the cooling FAN module (see ***Figure 3-9***). When the LED is ON, indicates that the fan has failed. When the LED is OFF, it indicates that the fan is functioning properly.

3.5 RAIDWatch Manager

The RAIDWatch Manager enables users to manage and maintain the RAID controllers using their web browsers. The Ethernet port at the back of each controller modules enables users to use a LAN cable to connect to the subsystem.

Detailed installation instructions for the RAIDWatch Manager are given in the RAIDWatch User's Manual.

NOTE:

The RAIDWatch User's Manual can be found on the CD-ROM that came with the system. To access the RAIDWatch User's Manual please refer to this file.

3.6 Notification Processing Center (NPC)

The NPC is a powerful module that runs as a background ***Disk and Executive Monitor*** (DAEMON) independent from RAIDWatch that can, itself, be installed redundantly on different hosts. It is used for event notification over Email, LAN broadcast, and SNMP traps. It helps to prevent blind time and keeps a user constantly informed as to the status of the storage management subsystem. The NPC functionality can be activated and the instructions are given in the ***RAIDWatch User's Manual***.

3.7 Audible Alarm

Whenever any of the threshold values assigned to the different controllers are violated or when an active device in the ES subsystem fails an audible alarm will be triggered. To determine what has triggered the alarm, users are encouraged to read the error message on the LCD screen or on the PC terminal.

WARNING!

If an alarm is triggered it is necessary for the user to determine the problem. If the audible alarm is ignored or not taken seriously and the problem is not rectified, unexpected damages might occur.

3.7.1 Default Threshold Values

The following table, ***Table 3-5***, shows the default threshold values for the subsystem. If any of these values are surpassed the alarm will sound:

	Upper Threshold	***Lower Threshold***
+3.3V	+3.6V	+2.9V
+5V	+5.5V	+4.5V
+12V	+13.2V	+10.8V
CPU Temperature	90ºC	0ºC
Board Temperature	80ºC	0ºC

Table 3-5: Default Threshold Values

The controller self-monitoring thresholds in ***Table 3-5*** are the default threshold values. Users can change the controller's preset values. To see how to change these values please refer to the ***Generic Operation Manual*** that came with your system. The enclosure's monitoring values are not user's options.

3.7.2 Failed Devices

If any of the following devices fails the audible alarm will be triggered.

- RAID Controller Modules
- Cooling Fan Modules
- PSU Modules
- BBU Modules
- Hard Drives

NOTE:

If the temperature should exceed a preset threshold, the controller's charger circuits will stop charging. You will then receive a message that says "Thermal Shutdown/Enter Sleep Mode." However, when temperature falls back within normal range, battery will resume the charging operation.

3.8 I^2C Monitoring

The presence detection and the general working status of cooling fan, and other modules are monitored through an I^2C serial bus. If any of these modules fails, the failure will be detected and the user notified through the various methods described above.

Chapter 4

System Connection and Operation

4.1 Overview

This chapter describes the operation of the subsystem series. This includes connecting to different external devices and different configuration options. This chapter gives a short introduction to Fibre channel and SCSI channel topologies, SFP connectors, lasers… etc. It also shows how the different models can be integrated into a storage network and a complete description of the power on and power off procedure is given.

4.2 FC Host Connection Pre-Requisites

NOTE:

The topics covered in section 4.2 only pertain to the FC models. If you have purchased a SCSI model please go to section 4.3 for sample topologies.

4.2.1 Cabling

The FC Standard allows for optical connections. Optical cables can be used over long distances and have been shown to be more reliable. Due to the extremely high data transfer rates; optical cables are preferred for 2Gbps fiber connectivity. Optical cables are less susceptible to EMI.

WARNING!

All Cables must be handled with care. They must not be bent; and to prevent interference within a rack system the routing path must be carefully planned.

4.2.2 FC Lasers

WARNING!

Lasers can cause eye damage. Operating the Fibre models of the subsystem requires purchasing separate SFP transceivers and cables. Pay attention to the warning messages that came with your cabling items and never look at lasers without knowing if they are on or off.

Wavelengths: **-** The lasers on fibre channel fiber optic cables emit either short wave (SW) beams (770nm – 860nm) or long wave (LW) (1270 nm - 1355 nm) beams. Cables that use either of these wavelengths can be used on the subsystem.

Laser Types: - two types of laser devices can be used in fiber cables: Optical Fibre Control (OFC) and non-OFC lasers. The OFC lasers are high-powered and can be used over long distances.

Safety features: - OFC lasers, due to their high power output, usually come with a safety mechanism that switches the laser off as soon as it is unplugged. Non-OFC lasers do not (due to their low power) come with these safety features but they can still inflict damage.

4.2.3 SFP Transceivers

Once you have purchased your FC cables, it may be necessary to connect them to SFP transceivers. These transceivers transmit electrical signals into laser beams. They should typically have at least 2Gbps bi-directional data links, a laser transmitter (for fiber optic cables), LC connector and a metal enclosure to lower the EMI.

NOTE:

LC connectors are small form factor, fiber-optic connectors based on a 1.25-mm ceramic ferrule and the familiar latching mechanism of the RJ-45 modular plug and jack.

Other beneficial features for a typical SFP transceiver include a single power supply and lower power dissipation. It is also preferable that these transceivers are hot-swappable. It is also important that any transceiver you use meets the Fibre Channel performance and reliability specifications.

NOTE:

SFP Modules are user-supplied items and must be purchased separately. Please contact your system vendor or Infortrend's technical support for a list of compatible modules.

4.2.4 Fibre Channel Topologies

The Fibre Channel Standard has been designed to support three separate topologies. They are point-to-point, fibre channel arbitrated loop (FC-AL) and fabric switch topologies.

- **Point-to-Point**: Point-to-point topology is the simplest topology that can be used. It is a direct connection between two fibre channel devices.

- **FC-AL**: This is the most common topology currently in use. Fibre channel devices are all connected in a loop or a star-like configuration using FC hubs. Each device is assigned an arbitrated loop physical address (AL_PA). The FC-AL is able to support 127 devices on a single loop.

- **Fabric**: The fabric topology can support up to 2^{24} Fibre channel devices. This topology allows many devices to communicate at the same time. To implement this topology a Fibre switch is required.

The ES FC models are able to support all three topologies discussed above.

4.3 SCSI Connection Pre-Requisites

4.3.1 SCSI Interfaces

SCSI stands for "small computer systems interface". It supports a number of devices, such as RAID, hard drives, CDROM drives, scanners, and other peripherals. SCSI was designed from the ground up to be a high-level, expandable, high-performance interface. Over the years, it has been THE best computer peripheral interface where speed is concerned.

Today, SCSI standards are developed, maintained and approved by a number of related organizations. Below is the brief introduction of two SCSI standards are being used by ES SCSI models.

SCSI-160 is a continuous superset of Ultra2. Except for the doubling data rate, the Ultra160 models operate using the same back-planes, connectors, cables, and other accessories. Although not recommended, mixing Ultra2 and Ultra160 devices will not cause a bus failure. Ultra160 devices will operate at the speed up to 160MB/second and Ultra2 80MB/second. ES Model ES A08U-G1A3 and ES A12U-G1A3 support Ultra160 SCSI.

SCSI-320 is the latest iteration of the SCSI drive interface standard. It enables maximum data transfer rates of up to 320MB/sec per channel, which is twice as fast as the Ultra160 standard. It also adds packetized commands, which will make command overhead comparable to fibre, thus further reducing the gap. ES Models ES A08U-G1410 and ES A12U-G1410 support Ultra320 SCSI.

NOTE:

1. *SCSI-160 is also known as Ultra160; SCSI-320 is also known as Ultra320.*
2. *When connecting to SCSI devices, use the cable provided in the ES subsystem packaging. You can connect up to 15 devices on each SCSI channel.*

4.4 Connecting to Host Ports

4.4.1 Points of Failure

The primary concern for configuring host-side topologies is that ***points of failure*** are avoided. It is often applied that host computers are equipped with two HBAs (Host Bus Adapters) so that disconnection of single host cable will not bring the system down. The Fibre models do not have by-pass circuits with its host ports. It is therefore preferable to connect the FC RAID subsystems to the host computer(s) through either Fibre channel hub(s) or Fibre switch(es).

4.5 Single Controller Host Connection

4.5.1 Single Host

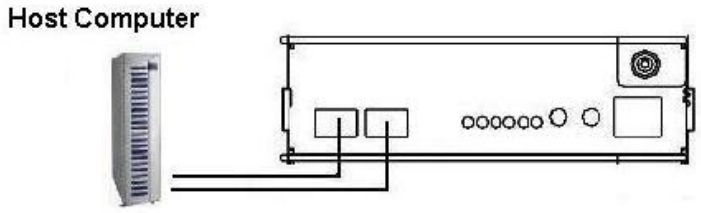

Figure 4-1: Single FC Controller connected to a single Host Computer

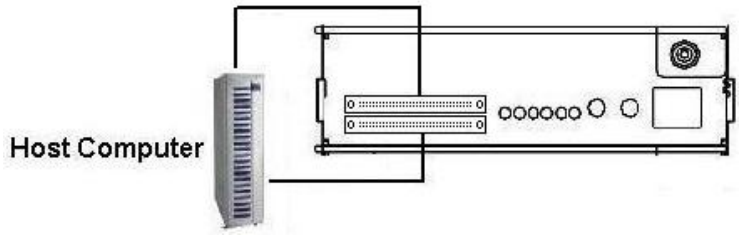

Figure 4-2: Single SCSI Controller connected to a single Host Computer

In the examples shown in ***Figure 4-1*** and ***Figure 4-2***, both the host ports are connected to a single host computer. This provides path redundancy. If one

of the host channels should be disconnected for some reason, or the cable connecting one of the host ports to the host computer is damaged, data flow should be routed through the second path, from the subsystem, to the host computer.

NOTE:

To create dual redundant data paths on the host side, it is necessary for third party fail-over software to be installed on the host computer.

4.5.2 Dual Hosts

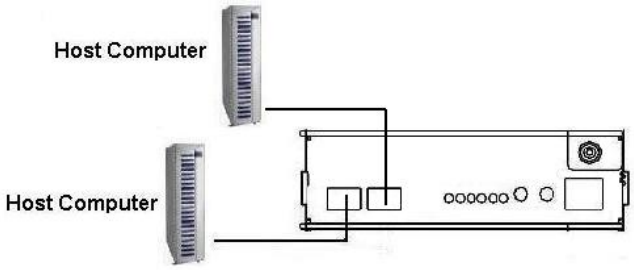

Figure 4-3: Single FC controller connected to two Host Computers

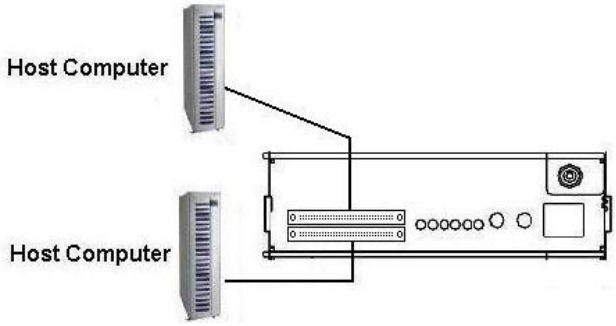

Figure 4-4: Single SCSI controller connected to two Host Computers

In the examples shown in ***Figure 4-3*** and ***Figure 4-4***, the host ports are connected to different host computers. This provides both path and host computer redundancy. If one of the host channels should be disconnected for some reason, or the cable connecting one of the host ports to the host computer is damaged, the second path can be used to transmit data, from the subsystem, to the host computer. Similarly, in the clustered hosts configuration, the same array can be accessed through different data paths and downtime will be minimized.

4.5.3 Fibre Channel Dual Hosts and Fibre Switch

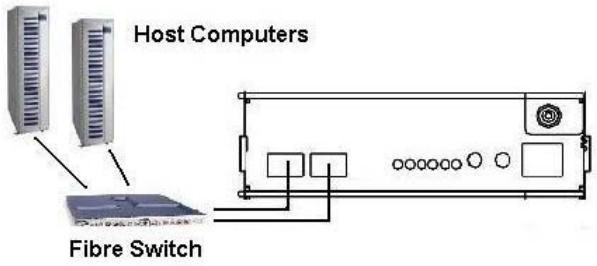

Figure 4-5: Single Controller Dual Host Fibre Switch Topology

In the configuration shown in ***Figure 4-5***, both host ports are connected to a single fibre switch, which is in turn connected to two host computers. Aside from having path redundancy you also have redundant host computers. If one of the host computers should fail or it's functioning interrupted, a clustered host can still accessed the same array and ensure that the data on the subsystem is readily available to the network.

4.6 Sample Configuration: Multi-Pathing

A multi-path topology, an example of which is shown in ***Figure 4-6***, ensures there is no single point of failure with I/O connectivity. All cabling components are configured into redundant pairs as will be discussed below.

Note that all series models are equipped with single RAID controller. If the RAID controller fails, the array will no longer be accessible.

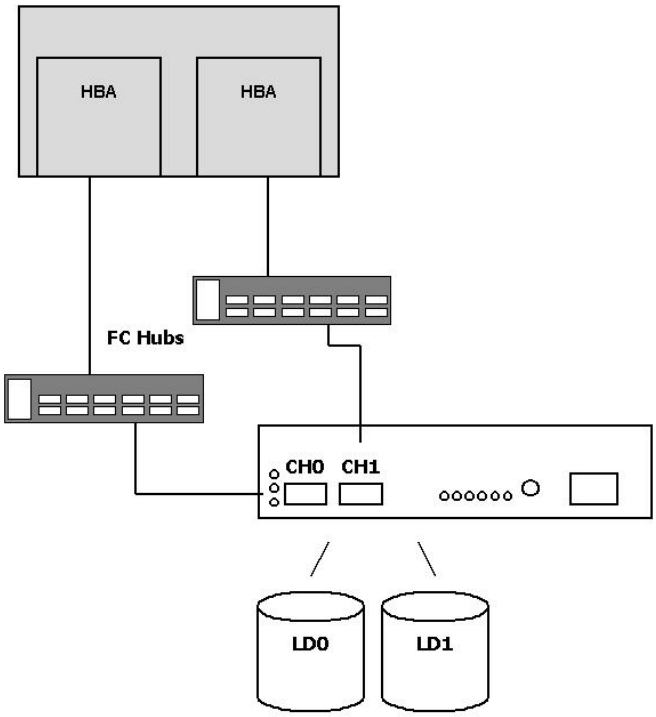

Figure 4-6: Sample Configuration: Multi-Pathing

Host Computer(s)	• One or more dual-ported computers. Each have two host adapter cards. • Redundant paths for connecting to the array ensure that host can still see data when one data path fails. • Note that access to the same array by different host computers can cause contention or data inconsistency. • Management software is necessary for access locking or re-directing data flow in the event of data path failure.

Logical Drives	LD0 and LD1: logical groups of drives The same logical drive can be made available on different host ports or multiple IDs on the same host port.

FC Hubs or Switches	Connection through different switches physically separates the access routes to the array, and guarantees there is no single point of failure.

ID/LUNs on Host Ports	**LD0** and **LD1** are made available as separate channel IDs on each host port. The host side management software should then choose to access certain array through specific ID and let the other ID assigned to the same array stays idle. In the event of data path failure, the once inactive IDs can be used to access the array.
Multiple Target IDs can be manually selected on each host port. And that multiple IDs can be associated with single array or any of the logical units (logical volume or partitions of the logical configurations).	

4.7 Power On

When all the components have been installed in the ES subsystem, drives installed, and the host channels have been connected to the host, the subsystem can be powered on.

4.7.1 Power On Checklist

BEFORE powering on the ES subsystem, please check the following:

1. ***Memory Modules*** – Memory modules have been correctly installed on the controller boards.

2. ***BBU Modules*** – If installed (12-bay models only), that the BBU modules have been installed correctly.

3. ***Hard Drives –*** Hard Drives have been correctly installed on the drive trays.

4. ***Drive Trays*** – **ALL** the drive trays, whether or not they have a hard drive, have been installed into the subsystem.

5. ***Cable Connections –*** The host ports on the subsystem have been correctly connected to host computer(s).

6. ***Power Cables –*** The power cords have been connected to the PSU modules on the subsystem and plugged into the mains.

7. ***Ambient Temperature*** – All the subsystem components have been acclimated to the surrounding temperature.

4.7.2 Power On Procedure

When powering on the ES subsystem, please follow these steps.

1. ***Power on Fibre channel connection devices***

   These devices include the hubs, switches and any other such device that has been connected to the ES subsystem. Please refer to the related documentation that came with your Fibre channel device to see the power on details.

2. ***Power on the ES subsystem***

   The ES subsystem should only be powered on after all the Fibre channel connection devices have been powered on first. The power-on procedure for the ES subsystem is described below.

3. ***Host Computers***

   The host computers should be the last devices that are turned on.

4.7.3 ES Power On-Procedure

To power on the subsystem, turn the two power switches, on the rear panel of the subsystem, on (see ***Figure 4-7***). Each switch controls a single PSU, therefore make sure that both switches are turned on.

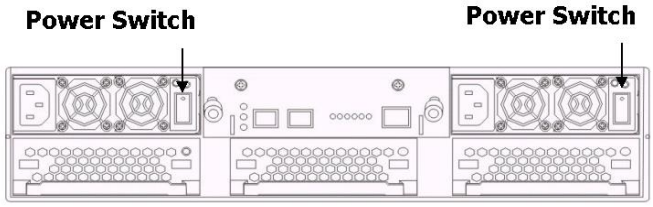

Figure 4-7: ES Subsystem Power Switches

CAUTION!

Although the PSUs are redundant and a single PSU can provide sufficient power to the system, it is advisable to turn both the power switches on. If only one PSU is operating and fails, the whole system will crash.

4.7.4 Power On Status Check

Once the ES subsystem has been powered on, the status of the entire subsystem should be checked to ensure that everything is running smoothly and that there are no complications or malfunctions.

1. ***Controller Module LEDs*** – The *controller ready, FC Host Ports Active (FC models), SATA Device Ports Active* LEDs should all flash green.

2. ***Drive Tray LEDs –*** The LEDs of all the drive trays (that contain hard drives) should be lit constant blue showing that drives have successfully spun up, and drives are ready for I/Os.

3. ***LCD Panel LEDs –*** The blue LED on the LCD panel should come on indicating that power is being supplied to the system.

4. ***Firmware and RAIDWatch*** – The overall status of the system may be checked using the terminal interface or the RAIDWatch GUI.

5. ***Audible Alarm -*** If any errors should occur during the initialization process, the onboard alarm should be sounded in a hastily repeated manner.

Drive tray LEDs should normally start flashing, indicating the RAID control unit is attempting to access the hard drives.

NOTE:

The subsystem has been designed to run continuously. Even if a component failure occurs the fault can be corrected online.

4.7.5 LCD Screen

When powering on the subsystem the following messages should appear on the front panel LCD screen. Wait for the front panel LCD to show "**READY**" or "**No Host LUN**" before the host boots up. Refer to ***Figure 4-8*** on how to read the screens.

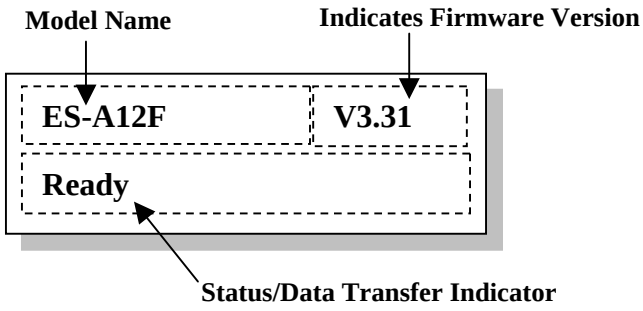

Figure 4-8: The LCD Start-Up Screen

The LCD screen startup sequence is shown and described in the sequence below.

Initializing…. **Please Wait...**	This screen appears when the PSUs are turned on.
Power on Self **Test, Please Wait...**	Proceeding with controller self test.
Power on Self **Test Completed**	Self-test completed.
ES-A12F v3.31 **Modem Not Config**	This screen appears after the initialization process. It clearly shows the model name.
ES-A12F v3.31 **128MB RAM, Wait…**	Verifying installed cache memory.
ES-A12F v3.31 **No Host LUN**	System is ready. You can now start to configure the subsystem.

4.8 Power Off Procedure

If you wish to power down the ES subsystem, please follow these steps:

NOTE:

If you wish to power down the ES subsystem, please ensure that no time-consuming processes, like a "Regenerating logical drive parity" or a "media scan," are running.

1. ***Stop IO access to the system***

   Stop all IO accesses from the host computers to the ES subsystem. Please refer to the related documentation of your host applications and operating system.

2. ***Disconnect the host***

The host must be disconnected from the subsystem. To do this, disconnect the cables from both the host and the ES subsystem.

3. ***Flush the cache***

   Use the “Shutdown Controller” function to flush all cached data. This prepares the RAID subsystem to be powered down.

4. ***Turn off the power***

   Turn off the power switches at the power supply modules. Once the RAID subsystem has been powered down, other devices that are connected to the subsystem may be powered down.

Chapter 5

System Maintenance

5.1 Overview

Constant monitoring and maintenance of your ES subsystem will minimize the chance of system downtime and preserve the working integrity of the system for a longer period of time. If any of the subsystem plug-in modules fails, they must be replaced as soon as possible.

WARNING!

Do not remove a failed component from the subsystem until you have a replacement on hand. If you remove a failed component without replacing it, the internal airflow will be disrupted and the system will overheat causing damage to the subsystem.

All the following components can be replaced in case of failure:

1. Controller Modules – ***Section 5.2***
2. PSU Modules – ***Section 5.3***
3. Cooling Fan Modules – ***Section 5.4***
4. Hard Drives – ***Section 0***
5. Hard Drive trays – ***Section 0***
6. Dongle kit – ***Section 5.6***

5.2 Replacing Controller Module Components

The controller module should never be removed unless the following replaceable components need to be accessed:

- BBU (optional for the 12-bay controller modules)
- Cache memory DIMM Modules
- Controller module itself

If any of these components fails, contact you vendor immediately for a replacement. To replace any of these components, the controller module must first be removed from the ES subsystem.

5.2.1 Removing the Controller Module

To remove the controller module:

1. Because the subsystem is equipped with single RAID controller, the subsystem must be either ***powered off*** (if possible) or in case of controller module failure, ***turned off*** the controll***er***.

2. ***Disconnect all cables*** that are connected to the controller module you wish to replace. These include the cables connecting to the host, Ethernet cables connected to the LAN port and the serial cable connected to the RS-232C audio jack.

3. Once all the cables have been disconnected, ***remove the retention screws*** from the sides of the controller module.

4. After both screws have been loosening, the controller module can be eased out of the controller module bay in the subsystem.

5. Carefully pull the controller module out of the subsystem chassis.

5.2.2 Replacing the BBU

To replace a failed BBU:

1. Remove the controller module from the subsystem. (See ***Section 5.2.1*** *Removing the Controller Module****)***

2. After the controller module has been removed from the chassis, ***disconnect the BBU cable*** from the connector on the side of the controller board.

3. Once the cable has been disconnected***, remove the retention screws*** from the arms of the BBU. These retention screws are attached to spacers installed to the controller's main circuit board.

4. When the failed BBU has been removed from the controller module, re-install the new BBU. To re-install the new BBU, refer to the BBU installation instructions in ***Section 2.6***.

5. After the new BBU has been installed, re-install the controller module back to the subsystem. (See ***Section 2.7***)

5.2.3 Replacing a Failed DIMM Module

To replace a failed DIMM module:

Remove the controller module from the subsystem chassis (see ***Section 5.2.1*** *Removing the Controller Module).* If your system comes with a BBU module, remove the BBU module is a must. (See ***Section 5.2.2*** *Replacing the BBU).*

WARNING!

A DIMM module should NOT be removed or installed while a BBU is connected. Doing so will cause serious damage to controller circuits.

1. After the controller module and the BBU module (if previously installed) have been removed, ***pull down the white clips*** on either side of the DIMM module to a 45-degree angle. This should dislodge the DIMM module.

2. ***Re-insert the new DIMM module***.

3. Once the new DIMM module has been installed***, re-install the BBU module*** (see ***Section 2.6***) and ***the controller module*** (see ***Section 2.7***) back to their original locations.

5.2.4 Replacing the Controller Module

If the controller module itself has failed, that means the whole system must be shut down. To replace a failed controller module:

1. ***Remove the controller module*** from the ES subsystem (see ***Section 5.2.1*** *Removing the Controller Module*), the BBU module (see ***Section 5.2.2*** *Replacing the BBU)* (if it was installed) and the DIMM module (see ***Section 5.2.3*** *Replacing a Failed DIMM Module).*

2. After these three items have been removed, ***install the DIMM module and the optional BBU module*** onto the new controller module.

3. Once the DIMM module and the optional BBU module have been installed on the new controller module, ***install the new controller module*** into the ES subsystem (see ***Section 2.7***).

4. ***Re-attach all the cables*** that were removed. These include the cables that are used to connect to the host, any Ethernet cable that was previously attached to the LAN port and the serial cable that was attached to the RS-232C audio jack.

5. ***Power up*** the system.

5.3 Replacing a Failed PSU Module

The PSUs are preinstalled components and accessed through the rear panel. If a PSU fails, contact your vendor and a failed unit must be replaced as soon as possible.

WARNING!

Although the PSU modules are fully redundant, it is not advisable to run the ES subsystem with a single PSU module for an extended period of time. If the second PSU module fails the sub-system will be shut down.

To replace a PSU please follow these steps:

1. ***Turn off the PSU***. The power switches are located on the right side of each power supply module. (See ***Figure 5-1***)

2. Once the power switches have been turned off, ***remove the power cables*** that connect the ES subsystem to the mains. The power cable socket is found on the left-hand side of each power supply module.

3. After the power cable has been removed from the socket, ***remove the retention screw*** on the upper right hand side of the PSU. (See ***Figure 5-1***) The screw is located right below the ejection handle, besides the LED indicator, and can be hidden from sight.

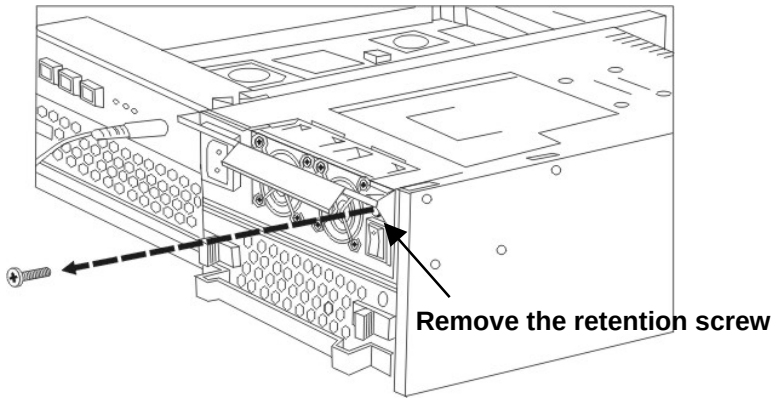

Figure 5-1: Removing the PSU Retention Screw

4. Pulling the ejection handle downwards disengages the module from chassis. Note that you may have to use one hand to pull the handle and while place another hand on enclosure chassis to balance the un-mating force. (See ***Figure 5-2***).

WARNING!

When a PSU is pulling out of the chassis, the relevant fan module, right below the PSU, is removed from the chassis at the same time. The replacement procedure recommended to be completed within 5 minutes to prevent the subsystem from overheating.

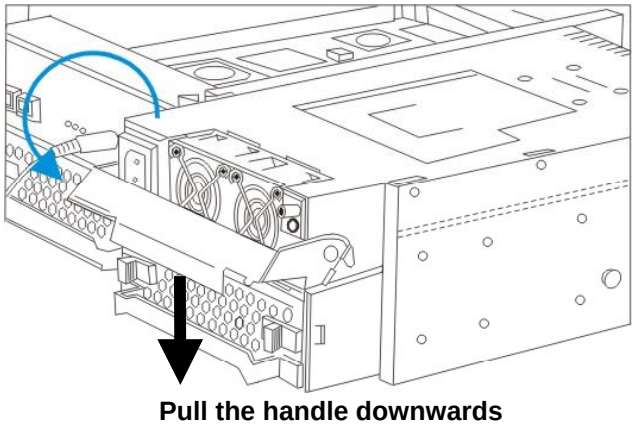

Figure 5-2: Dislodging the PSU

5. After the PSU module has been dislodged from the enclosure, you can gently pull the PSU module out of the enclosure. (See ***Figure 5-3***)

6. Once the faulty PSU has been removed, ***insert the new PSU module*** into the subsystem. Make sure the ejection handle is in its downright position so that the saddle notches on the lower edges of the handle can lock on to the edge metal brackets along the chassis inner walls. Push the PSU into the slot and pull the handle upwards to secure the module.

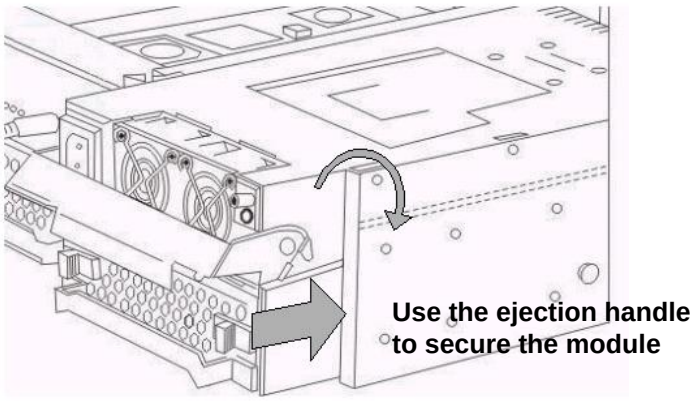

Figure 5-3: Installing the PSU into the subsystem

7. If properly installed, the back end of the module should be aligned with the enclosure's rear panel. To firmly secure the PSUs into place, reinsert the retention screw.

8. Reconnect the power cable that is used to connect the PSU module to the mains.

9. Turn the PSU module on.

5.4 Replacing a Failed Cooling FAN Module

The cooling fan modules are accessed through the rear panel. If one of the cooling FAN modules fails it must be replaced as soon as possible. To replace the cooling FAN module, please follow these steps:

WARNING!

1. *Although the cooling fan modules are fully redundant, it is not advisable to run the ES subsystem with a single cooling fan module for an extended period of time. If the only remaining cooling fan fails the system is at risk of sustaining irreparable damage.*

2. *Keep a failed module in enclosure bay until a replacement unit is in hand.*

1. Two retaining latches are used to secure the cooling fan module to the enclosure chassis. Pull the latches toward the center of the module to release it from the chassis. You may then hold the handle at the bottom and pull the module out of the chassis. (See ***Figure 5-4***).

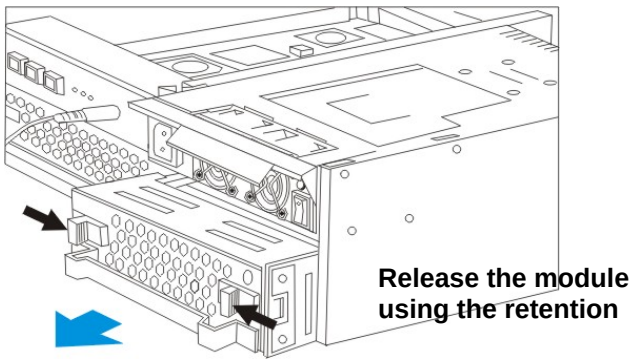

Figure 5-4: Removing the Cooling FAN Module

2. Once the malfunctioning cooling fan module has been removed, gently slide the new cooling fan module into the ES chassis.

3. The retaining screws will hold the module in place.

5.5 Replacing a Failed Hard Drive

To replace a hard-drive please follow these steps.

1. Carefully verify the location of the failed drive.

2. To access drives on the side columns, flip the retention latches on the front handles and swing them to the sides. ***Remove the drive tray*** from the ES enclosure by flipping its tension clip and lifting the front flap bezel.

3. ***Open the front flap***. To open the front flap, lift up the clip at the front of the drive tray. This will dislodge the hard drive from the enclosure and the hard drive can be carefully withdrawn.

   Do not run the system with the front flap open.

4. ***Remove the retention screws*** on the sides of the drive tray from the hard drive and then remove the hard-drive from the drive tray.

5. ***For the systems using PATA hard drives***, once the hard drive has been removed from the drive tray, ***disconnect the drive*** from the dongle board.

6. Install the new hard drive. Please refer to the complete hard drive installation procedure in Chapter 2.

5.6 Replacing a Dongle Kit

If a dongle kit is found faulty or malfunctioning in some way it needs to be replaced. To replace the dongle kit, please follow the instructions below.

1. **Remove the drive tray** from the drive bay in the subsystem.

2. After the drive tray has been removed, **remove the hard drive from the drive tray**.

3. After the hard drive has been removed, ***turn the drive tray over*** and ***remove the three retention screws*** that hold the dongle kit in place.

4. Once the retention screws have been removed, re-install the new dongle kit using the instructions given in ***Chapter 2***.

5. Once the new dongle kit is installed on the drive tray***, re-install the hard drive***.

6. After the hard drive has been placed in the hard drive, ***re-insert the drive tray*** into the ES subsystem.

Appendix A

Specifications

A.1 Flexible Configuration Options

A.1.1 The RAID Controller Engine

The ES series described in this manual comes powered by a single RAID controller. All series models come with either two SFP sockets or two VHDCI SCSI connectors that are used to connect the subsystem to a host computer. The 8-bay models have a dummy plate in place of the drive bays on the bottom row of the chassis.

The major functions of the RAID controller unit are: main processor, hardware XOR engine, Qlogic 2312 or LSI 53C1010R or LSI53C1030T I/O channel processors, Marvell Serial ATA chipsets, flash, NVRAM, DUART, cache memory and cache interface. Logics of other support interfaces, e.g., hot-swap mechanisms… etc. are provided by the enclosure. Although it is a single controller model, the controller is hot-swappable via the connectors on the back-end PCB that provide pins of different pin lengths.

A.1.2 Rear Panel Variations

The rear panels on the 8-bay and 12-bay models do not appear the same. The 8-bay models have a pre-attached sheet placed over the bottom controller bay. The 12-bay models have an extra cooling fan module installed to the lower controller bay. The dummy plate should never be removed as it is used to normalize the chassis airflow.

A.2 Technical Specifications

RAID Controller Module Specifications	
Main Processor	PowerPC 750CXe 400MHz with 256KB of internal L2 running at the processor's core speed
Host Channel Interface	Two FC-2G Fibre channels - *OR* - Two SCSI-160 SCSI channels - *OR* - Two SCSI-320 SCSI channels
FC protocol	Point-to-point, FC-AL, and switched fabric; no by-pass onboard, by-pass circuits should be provided externally
Drive Interface	Eight (8) or Twelve (12) 1.5Gbps Serial ATA channels
RAID Controlling Unit	Architectural Features: ▪ 133MHz Hardware XOR engine; 133MHz memory bus; dedicated for dual-PCI bandwidth. ▪ 133MHz, ECC, 128MB to 1GB SDRAM DIMM memory support ▪ Optional Li-Ion battery module for up to 72 hours of backup time using a 512MB memory (optional for the 12-bay models only) ▪ 4MB onboard flash memory for controller firmware with a real time clock (noting controller event time of occurrence and for scheduling maintenance tasks by future firmware)
RAID Controller Interfaces	▪ SFP, LC type connector sockets for optical fiber connection - *OR* - VHDCI 0.8mm dual stack mini-SCSI connectors ▪ RJ-45 Ethernet connector receptacle ▪ Audio jack serial port ▪ LCD keypad panel on the front foldable handle ▪ Other signals routed through hot-pluggable FCI connectors to back-end PCBs

System Environment	
Relative Humidity	5 ~ 95% (non condensing – operating and non-operating)
Temperature	Operating: 0º to 40ºC Non-operating: -40º to +65ºC
Thermal Cycle	0 ~ +40ºC (95% RH @ +40ºC), 12hrs/step, 10 cycles (Op) and –40 ~ +65ºC (95% RH @ +65ºC), 48hrs/step, 1cycle (Non-operating)
Altitude	Operating: 0 ~ 10,000 ft Non-operating: 0 ~ 40,000 ft

Power Requirements	
Input Voltage	90VAC @ 8AC 260VAC @ 4AC with PFC (auto-switching)
DC Output	12V – 24A 5V – 25A 3.3V – 20A
Frequency	47 – 63Hz
Power Capacity	350W

Dimensions (8-bay and 12-bay models)	
Height	88 mm
Width	446.2 mm
Length	486.5 mm

EMI/EMC
• FCC Class-A (Fibre) Class-B (SCSI) • CE • UL

Shock	
Half-sine	Operating: 5G peak, 11ms duration, Non-operating: 15G, 11s, half-sine

Vibration	
Operating	5~500Hz, 0.2G, X/Y/Z
Non-operating	5~500Hz, 1G, X/Y/Z

Warning Alarms
• Audible Alarms • System LEDs • Local and remote Event notification via the RAIDWatch manager, manager screen, Event Monitor, terminal sessions and LCD screen events

A.3 RAID Operation Specifications

Specification	
RAID Levels	0, 1(0 + 1), 3, 5, 10, 30, 50, JBOD, and Non-RAID disk spanning
Host O/S Compatibility	Host O/S Independent
Host Interface	FC-2G *– OR -* SCSI-160 *- OR –* SCSI-320
Host Channels	Pre-configured host channels
Drive Interface	Support 8 or 12 channels of 1.5Gbps SATA
Drive Channels	All drive channels are pre-set and cannot be changed.
Cache Mode	Write-through or write-back; variable optimization parameters per array
Cache Memory	Up to 1GB SDRAM with/without ECC, non-registered
Number of LUNs	Up to 32 per host ID, a maximum up to 1024 depending on system configuration
Multiple Target ID's/host Channel	Yes
Aliases for target IDs	Yes
Firmware on Flash Memory	Yes
Drive Hot-swapping	Yes; w/ transparent reset of hung drives

A.4 Drive Tray Specifications

Specification	
Tray Pitch	27.6mm
Tray Width	< 110mm
Tray Carrier Depth	180mm
Tray Plastic Depth	30mm
Total Depth	210mm (= 180mm + 30mm)

A.5 Power Supply Specifications

Specification	
Dimensions	248.9mm (D) x 128.8mm (W) x 81.6mm (H)
Module deployment	Dual-redundant configuration. Independent AC input and power switch on each power supply
Nominal Power	350W
DC output	**12.0V:** 24A **5.0V:** 25A **3.3V:** 20A
Input Frequency	47 ~ 63Hz
AC Input	90VAC @ 8AC – 260VAC @ 4AC with PFC
Power factor correction	Yes
Hold-up time	At least 16ms at 115/230VAC full load after a loss of AC input
Over temperature protection	Over-current and over-voltage protection; auto-shutdown on lost cooling or excessive ambient temperature
Cooling Fans	Two fans for each unit (inside PSU)

A.6 Cooling Fan Specifications

Specification	
Dimensions	120mm x 120mm x 32mm (H)
Vendor's model name	Delta – BFB1212VH DC brush-less blower
Speed	3100 rpm
Max. air flow	39.55CFM
Input power	15W
Acoustic noise	56.5dB-A
Operating temperature	-10 ~ +60ºC
Storage temperature	-40 ~ +75ºC

A.7 Management

Specification	
Configuration	▪ Text-based firmware-embedded utility over RS-232C through the included serial cable ▪ LCD keypad panel ▪ The RAIDWatch manager program using In-band or Ethernet connection
Performance Monitoring	Yes
Remote control and monitoring	Yes (via RAIDWatch GUI manager and its sub-module, NPC)
Event Broadcast/Alert	Yes (via Java-based RAIDWatch manager, NPC, and Event Monitor)
Remote Event Notification	Yes (Via RAIDWatch's sub-module, NPC)
Hardware Connection	In-band over SCSI/Fibre, Out-of-band via Ethernet or serial port
Configuration on Disk	Configuration Data stored on disks for logical drive assemblies to exist after controller is replaced.
Failure Indicators	Voltage, temperature, BBU, fan, fan speed, disk drive, and power supply status. Faults are indicated via Alarm, module LED indicators, LCD display, RAIDWatch Manager, or terminal session. Thermal detect with BBU module. Controller can commence an auto-shutdown on overheated or module failure conditions.

Appendix B

Spare Parts and Accessories

B.1 Overview

Active components, such as PSUs and fan modules, in the ES subsystem can be replaced online. If any of these components fail then they can, if configured in a redundant pair, be hot-swapped. The different spare parts for the ES subsystem can be ordered separately. This Appendix lists the model names for the available and compatible spare parts and accessories items. Please use these model names provided, if you need to order any individual parts.

B.2 Spare Parts

The active components and their model names are listed in the table below.

B.2.1 General Spare Parts

The spare parts shown in the table below are common to all the models described in this series.

Model Name	Description
IFT-9272CDTray	HDD Tray
IFT-9272CPSU	Power Supply Unit
IFT-9272CFanMod	Cooling Fan Module

B.2.2 Controller Modules

Model Name	Description
IFT-9272AFGCM08	Controller module for ***A08F***, including IFT-7260S-8F2D
IFT-9272AFGCM08M1	Controller module for ***A08F***, including IFT-7260S-8F2D Preinstalled with a 128MB DIMM
IFT-9272AFGCM12	Controller module for ***A12F***, including IFT-7260S-12F2D
IFT-9272AFGCM12M1	Controller module for ***A12F***, including IFT-7260S-12F2D Preinstalled with a 128MB DIMM
IFT-9272AUGCM08	Controller module for ***A08U***, including IFT-7260S-8U3D
IFT-9272AUGCM08M1	Controller module for ***A08U***, including IFT-7260S-8U3D Preinstalled with a 128MB DIMM
IFT-9272AUGCM12	Controller module for ***A12U***, including IFT-7260S-12U3D
IFT-9272AUGCM12M1	Controller module for ***A12U***, including IFT-7260S-12U3D Preinstalled with a 128MB DIMM
IFT- 9272AU4GCM08	Controller module for ***A08U***, including IFT-7260S-8U4D
IFT-9272AU4GCM08M1	Controller module for ***A08U***, including IFT-7260S-8U4D Preinstalled with a 128MB DIMM
IFT- 9272AU4GCM12	Controller module for ***A12U***, including IFT-7260S-12U4D
IFT-9272AU4GCM12M1	Controller module for ***A12U***, including IFT-7260S-12U4D Preinstalled with a 128MB DIMM

B.3 Accessories and Optional Items

The accessories and their model names are listed in the table below.

Model Name	Description
IFT-9270CUHCab	External SCSI round cable for host connection (SCSI models) – mini-SCSI- to-SCSI 68-pin connectors
IFT-9270ASCab	RS-232C serial cable; audio jack to DB-9
IFT-9272CSlider	Slide rails, optional
IFT-9270ABT	BBU Module (optional for 12-bay models)
IFT-9011	Null Modem
IFT-9270AN1S1P-0011	Dongle board; SATA-to-ATA
IFT-9272ADT1S1P	HDD tray pre-installed w/ a dongle board

Appendix C

Electrical Interfaces and Pinouts

C.1 SFP Socket Connector Pin Outs

Each of the SFP host or expansion ports is comprised of a case bottom, an EMI case, and a 20-pin host connector. These port sockets receive Small-Form-Factor fiber optic and copper-based transceivers. You may contact our technical support for an updated list of SFP transceiver modules that have been tested to comply with the sockets.

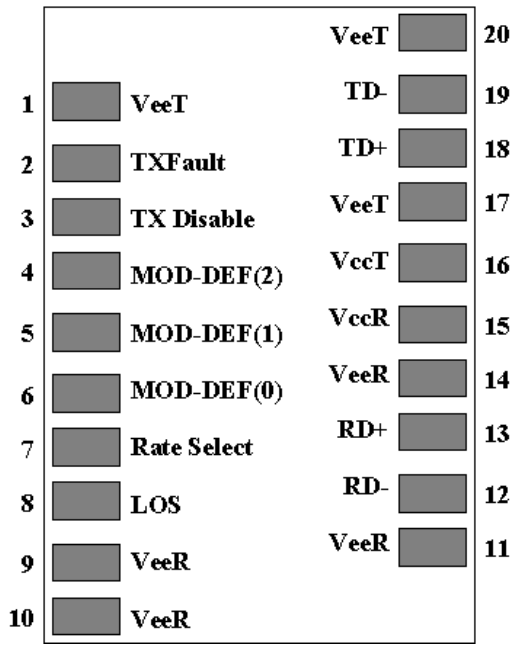

Figure D-1: SFP Socket Connector Pin-Outs

Pin	Pin Name	Pin Description
1	VeeT	Transmitter Ground (Common with Receiver Ground)
2	TXFault	Transmitter Fault. Not supported
3	TX Disable	Transmitter Disable. Laser output disabled on high or open.
4	MOD_DEF(2)	Module Definition 2. Data line for Serial ID.
5	MOD_DEF(1)	Module Definition 1. Clock line for Serial ID.
6	MOD_DEF(0)	Module Definition 0. Grounded within the module.
7	Rate Select	No connection required
8	LOS	Loss of signal indication. Logic 0 indicates normal operation.
9	VeeR	Receiver Ground (Common with Transmitter Ground)
10	VeeR	Receiver Ground (Common with Transmitter Ground)
11	VeeR	Receiver Ground (Common with Transmitter Ground)
12	RD-	Receiver inverted DATA out. AC coupled
13	RD+	Receiver Non-inverted DATA out. AC coupled
14	VeeR	Receiver Ground (Common with Transmitter Ground)
15	VccR	Receiver Power Supply
16	VccT	Transmitter Power Supply
17	VeeT	Transmitter Ground (Common with Receiver Ground)
18	TD+	Transmitter Non-Inverted DATA in. 100 ohm termination between TD+ and TD-, AC Coupled thereafter.
19	TD-	Transmitter inverted DATA in. See TD+
20	VeeT	Transmitter Ground (Common with Receiver Ground)

Table D-1: SFP Pinouts Definitions

C.2 SCSI Port Pinouts

* NC=No Connection, * GND=Ground,
* TPWR=Terminator Power

Pin	Name	Pin	Name
1	SD12+	35	SD12-
2	SD13+	36	SD13-
3	SD14+	37	SD14-
4	SD15+	38	SD15-
5	SDP1+	39	SDP1-
6	SD0+	40	SD0-
7	SD1+	41	SD1-
8	SD2+	42	SD2-
9	SD3+	43	SD3-
10	SD4+	44	SD4-
11	SD5+	45	SD5-
12	SD6+	46	SD6-
13	SD7+	47	SD7-
14	SDP0+	48	SDP0-
15	GND	49	GND
16	DIFSENS	50	GND
17	TPWR	51	TPWR
18	TPWR	52	TPWR
19	NC	53	NC
20	GND	54	GND
21	SATN+	55	SATN-
22	GND	56	GND
23	SBSY+	57	SBSY-
24	SACK+	58	SACK-
25	SRST+	59	SRST-
26	SMSG+	60	SMSG-
27	SSEL+	61	SSEL-
28	SC_D+	62	SC_D-
29	SREQ+	63	SREQ-
30	SI_O+	64	SI_O-
31	SD8+	65	SD8-
32	SD9+	66	SD9-
33	SD10+	67	SD10-
34	SD11+	68	SD11-

Table D-2: SCSI Port Pinouts Definitions

C.3 DB9 Audio Jack Pinouts

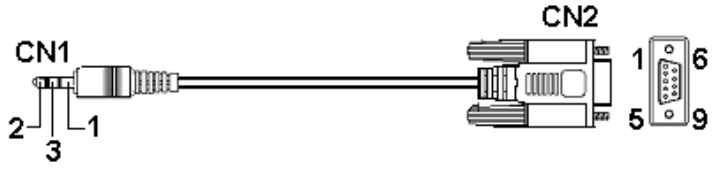

Figure D-2: RS-232C (Audio Jack) Pinouts

CN1 Pin Number	Pin Name	CN2 Pin Number
1	Ground	5
2	Brown	3
3	Black	2
For CN 2	Pin 4 and Pin 6 are short	Pin 7 and Pin 8 are short

Table D-3: Audio Jack Pinouts Definitions

C.4 Ethernet Port Pinouts

Pin	Pin Name	Pin	Pin Name
1	LAN_TXP	**7**	LAN_RXP
2	LAN_TXN	**8**	LAN_RXN
3	CT	**9**	Pulled High for Pin 10
4	N1	**10**	LAN_LEDG (Link OK)
5	N1	**11**	Pulled High for Pin12
6	CT	**12**	LAN_LEDY (Data transfer)

Table D-4: Ethernet Port Pinouts Definitions

C.5 Mains Power

IEC type receptacle.